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R.G.

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/259,762	03/01/99	YIN Z	303.531US1

EXAMINER	
DIAZ, J	
ART UNIT	**PAPER NUMBER**
2815	

DATE MAILED: 02/14/01

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MM92/0214

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No.	Applicant(s)	
	09/259,762	YIN ET AL.	
	Examiner	Art Unit	
	José R. Díaz	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 December 2000* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3 and 5-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3 and 5-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15) ☒ Notice of References Cited (PTO-892)
16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
18) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
19) ☐ Notice of Informal Patent Application (PTO-152)
20) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-3, and 5-11 rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (US Patent No. 6,143,666) in view of Puntambekar et al. (US Patent No. 5,714,037).

Regarding claim 1, Lin et al. teaches a plasma surface treatment method comprising: providing a semiconductor substrate (20) comprising a film (22) (See Figure 3); treating the film (22) in a vacuum of about 3.0-6.5 Torr (See column 9, line 10), for a time of about 10 seconds to about 5 minutes (See column 9, line 19), and in an atmosphere comprising oxygen plasma (24) wherein the oxygen plasma flow rate is at

least about 300 sccm oxygen (See column 9, lines 15-16) thereby rendering the substrate resistant to profile distortion to make a treated substrate (22') (See Figure 4); applying a resist (26) to the treated substrate (22'); and patterning the resist (26a, 26b, and 26c) (See Figure 5).

Regarding claim 2, Lin et al. teaches exposing oxygen gas to an energy source generating about 150-900 watts in order to make the oxygen plasma (See column 9, line 11).

Regarding claim 3, Lin et al. teaches that the oxygen plasma is made by electromagnetic excitation of oxygen gas by electrodes that are about 180-280 mils apart. Regarding the difference in the range of separation of the electrodes between the prior art and the application, it would have been obvious to one of ordinary skill in the art, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Regarding claim 5, Lin et al. teaches that the oxygen plasma is made by an exposure of oxygen gas to an energy source that is RF energy (See column 9, line 12).

Regarding claim 9, Lin et al. teaches removing the resist (48a, 48b, 48c) from the film (45') (See column 15, lines 25-28).

Regarding claim 10, Lin et al. teaches that the oxygen flow rate is not greater than about 2000 sccm (See column 9, lines 15-16).

Lin et al. do not teach treating a film comprising silicon nitride in an atmosphere comprised of oxygen plasma. Puntambekar et al. teaches that it is well known in the art

to treat a silicon nitride film (16) in an atmosphere comprised of oxygen plasma (column 1, lines 46-50). Puntambekar et al. provide motivation to use such a step in that the adhesion between the silicon nitride film (16) and a polyimide film (18) is improved (See column 5, lines 12-15 and 21-24). Therefore, it would have been obvious to one having ordinary skill in the art at the same time the invention was made to have modified Lin et al. to include treating a film comprising silicon nitride in an atmosphere comprised of oxygen plasma as taught by Puntambekar et al. since such modification would result in improved adhesion between the silicon nitride film and the polyimide film, as described in column 5, lines 12-15 and 21-24 of Puntambekar et al.

Furthermore, Lin et al. do not teach adding an inert gas to the oxygen gas. Regarding claim 11, Puntambekar et al. teaches that it is well known in the art to add argon to the oxygen gas (column 5, line 20). Puntambekar et al. provide motivation to use such a gas in that the argon ions make the surface of the silicon nitride more susceptible to accepting the oxygen ions also contained in the plasma (See column 5, lines 16-19). Therefore, it would have been obvious to one having ordinary skill in the art at the same time the invention was made to have modified Lin et al. to include an inert gas as taught by Puntambekar et al. since such modification would result in a silicon nitride having surface more susceptible to accepting the oxygen ions also contained in the plasma, as described in column 5, lines 16-19 of Puntambekar et al.

Regarding claim 6, Official Notice is taken with respect to the limitation wherein the oxygen plasma is made by an exposure of oxygen gas to an energy source that is microwave energy since it is well known in the art that using microwave energy is an

alternative method of forming an oxygen plasma (See for example Spencer et al. US Patent No. 4,673,456).

Official Notice is taken with respect to claims 7 and 8 since the method for treating a film in an atmosphere comprised of oxygen plasma disclosed by Lin et al. in view of Puntambekar et al. has the same parameters as disclosed by Applicant, and hence it is obvious to one of ordinary skill in the art that such a method would result in the reduction of footing and undercutting, as claimed by Applicant.

Response to Arguments

Applicant's arguments with respect to claims 1-3, and 5-11 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Lin et al. (US Patent No. 5,807,660) disclose a plasma treatment. Sun et al. (US Patent No. 5,674,357) disclose a semiconductor cleaning substrate cleaning process.

Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to José R. Díaz whose telephone number is (703) 308-6078. The examiner can normally be reached on 8:00 - 5:00 Monday through Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (703) 308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

JRD
February 9, 2001

EDDIE C. LEE
PRIMARY EXAMINER